Discovering States and Transformations in Image Collections

Phillip Isola*, Joseph J. Lim*, and Edward H. Adelson
* = equal contribution

Input: *tomato*   Discovered states

Discovered transformations
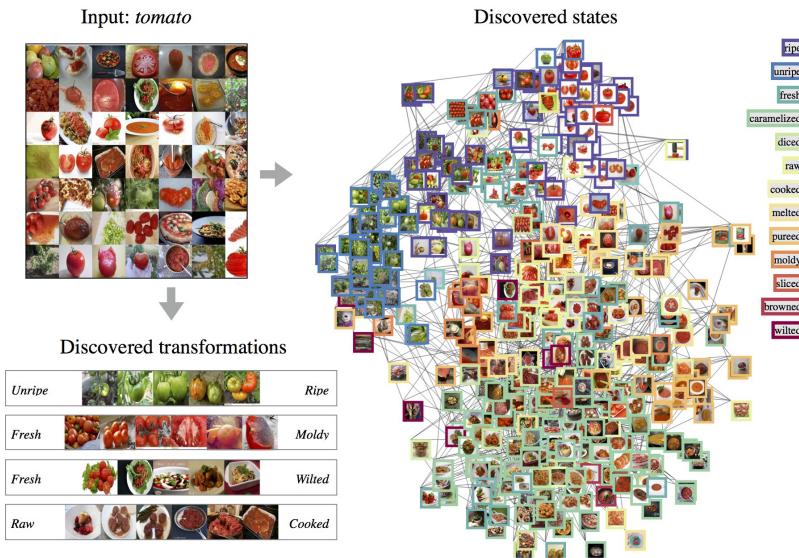
Example input and automatic output of our system: Given a collection of images from one category (top-left, subset of collection shown), we are able to parse the collection into a set of states (right). In addition, we discover how the images transform between antonymic pairs of states (bottom-left).

Objects in visual scenes come in a rich variety of transformed states. A few classes of transformation have been heavily studied in computer vision: mostly simple, parametric changes in color and geometry. However, transformations in the physical world occur in many more flavors, and they come with semantic meaning: e.g., bending, folding, aging, etc. The transformations an object can undergo tell us about its physical and functional properties. In this paper, we introduce a dataset of objects, scenes, and materials, each of which is found in a variety of transformed states. Given a novel collection of images, we show how to explain the collection in terms of the states and transformations it depicts. Our system works by generalizing across object classes: states and transformations learned on one set of objects are used to interpre the image collection for an entirely new object class.

Download paper
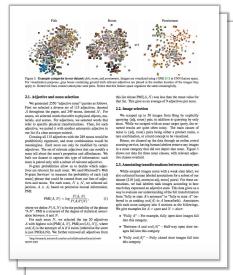
Download dataset

63,440 images depicting 245 nouns modified by a total of 115 adjectives. Each individual noun is only modified by ~9 adjectives it affords.

Poster
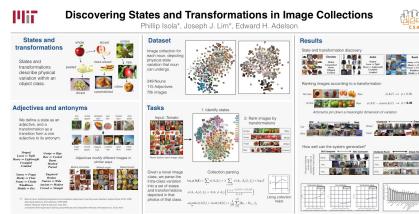
Bibtex

```
@inproceedings{StatesAndTransformations,
    author="Phillip Isola and Joseph J. Lim and Edward H. Adelson",
    title="Discovering States and Transformations in Image Collections",
    booktitle="CVPR",
    year="2015"
}
```